

**APPLICATION OF ROLF M. ALTER  
FOR  
LIGHTWEIGHT, STRUCTURALLY INTEGRAL,  
AND STRONG COMPOSITE RACK SHELVING**

**ATTORNEY DOCKET: 14046 B**

1

## **BACKGROUND OF THE INVENTION**

2 **Field of the Invention:**

3 The present invention relates to rack shelving. More particularly, it relates to  
4 lightweight, structurally integral, strong composite rack shelving.

5 **Description of the Prior Art:**

6 Numerous innovations for rack shelving have been provided in the prior art. Even  
7 though they frequently are suitable for specific purposes which they address, they each differ  
8 in structure and/or operation and/or purpose from the present invention and they therefore are  
9 not suitable for the purposes of the present invention.

10 A typical prior art rack system **20** can be seen in **FIGURES 1 and 2**, which are,  
11 respectively, a diagrammatic perspective view of a typical prior art rack system illustrating  
12 columns, beams, and a shelf thereof in use, and an enlarged diagrammatic top plan view of the  
13 area generally enclosed by a dotted curve identified by **ARROW 2** in **FIGURE 1** illustrating  
14 a spacer utilized for the shelf shown in **FIGURE 1**, and as such, will be discussed with  
15 reference thereto.

16 The typical prior art rack system **20** comprises columns **22**, beams **24**, and a shelf **26**.  
17 The columns **22** are vertical support members which interconnect with the beams **24** which  
18 are horizontal support members. Each column **22** has rows of slots **28** which are vertically  
19 extending and each beam **24** has pins **30** which are spaced apart from each other and which

1      insert into the slots **28** in the column **22**. Each beam **24** further has a step **32** extending  
2      therealong which has the shelf **26** rest thereon.

3              The beam **24** is connected to the column **22** by first inserting the pins **30** of the beam  
4      **24** into upper portions **34** of the slots **28** in the column **22** and then sliding the pins **30** of the  
5      beam **24** downwardly into lower portions **36** of the slots **28** in the column **22**. When the beam  
6      **24** is so connected, a portion of the pin **30** of the beam **24** projects beyond an associated slot  
7      **28** in the column **22** to secure the beam **24** from axially disengaging from the column **22**, *i.e.*,  
8      the beam **24** can only be disconnected by reversing the connection sequence.

9              Once the beam **24** is connected to the column **22** by inserting the pins **30** of the beam  
10     **24** into the upper portions **34** of the slots **28** in the column **22** and sliding them downwardly  
11     into the lower portions **36** of the slots **28** in the column **22**, the beam **24** will remain secured  
12     to the column **22** so long as there is a downward force on the pins **30** of the beam **24**.

13              The shelf **26** comprises a plurality of boards **38**, which are free from each other, and  
14     which are wood. Each board **38** of the shelf **26** extends transversely, and has a pair of ends  
15     **40** which rest on the steps **32** of the beams **24**, respectively. The plurality of boards **38** of the  
16     shelf **26** are spaced-apart from each other by spacers **42**.

17              Each spacer **42** is bent from a strip of metal into a body **44** and a pair of wings **46**. The  
18     body **44** of the spacer **42** generally is U-shaped and has terminal ends **48** from which the pair  
19     of wings **46** of the spacer **42** extend perpendicularly outwardly.

1           The spacer **42** rests on the step **32** of the beam **24** with the body **44** of the spacer **42**  
2   spacing apart a pair of adjacent boards **38** of the shelf **26**. The spacer **42** is maintained on the  
3   step **32** of the beam **24** only by the pair of wings **46** of the spacer **42** being sandwiched  
4   between adjacent ends **40** of the pair of adjacent boards **38** of the shelf **26** and the beam **24**.  
5   Each board **38** therefore must have a specific width, *i.e.*, a width extending from the body **44**  
6   of one spacer **42** to the body **44** of an adjacent spacer **44**.

7           Thus, the shelf **26** comprises a plurality of separate, non-mechanically connected parts,  
8   namely, the plurality of boards **38** and the spacers **42**, and as a result thereof, afford little  
9   structural integrity for the shelf **26**. Further, the shelf **26** is heavy as a result of the plurality  
10   of boards **38** being wood.

11          Thus, there exists a need for composite rack shelving which affords structural integrity  
12   by having no non-mechanically connected parts, is light weight and strong, and allows flames  
13   thereunder to pass upwardly therethrough instead of sidewardly therealong and an  
14   extinguishant thereabove to pass downwardly therethrough and extinguish the flames  
15   thereunder.

1

## SUMMARY OF THE INVENTION

2           **ACCORDINGLY, AN OBJECT** of the present invention is to provide lightweight,  
3 structurally integral, and strong composite rack shelving that avoids disadvantages of the prior  
4 art.

5           **ANOTHER OBJECT** of the present invention is to provide lightweight, structurally  
6 integral, and strong composite rack shelving that is simple to use.

7           **BRIEFLY STATED, STILL ANOTHER OBJECT** of the present invention is to  
8 provide lightweight, structurally integral, and strong composite rack shelving that includes a  
9 shelf. The shelf comprises a honeycomb core sandwiched between an upper skin and a lower  
10 skin so as to form a composite structure that is lightweight and strong. The shelf has a  
11 plurality of through bores that pass vertically therethrough and allow flames under the shelf  
12 to pass upwardly therethrough instead of sidewardly therealong and allow an extinguishant  
13 thereabove to pass downwardly therethrough to extinguish flames thereunder.

14           Novel features which are considered characteristic of the present invention are  
15 identified in the appended claims. The invention itself, however, both as to its construction  
16 and its method of operation, together with additional objects and advantages thereof, will be  
17 best understood a description of the invention which follows, read in connection with the  
18 accompanying drawings.

1

## BRIEF DESCRIPTION OF THE DRAWINGS

2        The figures of the drawings are briefly described as follows:

3        **FIGURE 1** is a diagrammatic perspective view of a typical prior art rack system  
4                    illustrating columns, beams, and a shelf thereof in use;

5        **FIGURE 2** is an enlarged diagrammatic top plan view of the area generally enclosed by the  
6                    dotted curve identified by **ARROW 2** in **FIGURE 1** illustrating a spacer  
7                    utilized for the shelf shown in **FIGURE 1**;

8        **FIGURE 3** is a diagrammatic perspective view of a rack system illustrating the prior art  
9                    columns, the prior art beams, and the composite shelf of the present invention  
10                  in use, with the composite shelf being lightweight, structurally integral, and  
11                  strong;

12       **FIGURE 4** is an enlarged diagrammatic perspective view of the area generally enclosed by  
13                  the dotted curve identified by **ARROW 4** in **FIGURE 3** illustrating the  
14                  lightweight, structurally integral, and strong composite rack shelving of the  
15                  present invention shown in **FIGURE 3**;

16       **FIGURE 5** is a diagrammatic top plan view taken generally in the direction of **ARROW**  
17                  **5** in **FIGURE 4** illustrating the lightweight, structurally integral, and strong  
18                  composite rack shelving of the present invention shown in **FIGURE 4** with a  
19                  portion of the upper skin thereof removed to reveal a portion of the honeycomb  
20                  core thereof at an enlarged scale;

21       **FIGURE 6** is a diagrammatic cross sectional view taken along line 6-6 in **FIGURE 5**; and

22       **FIGURE 7** is a diagrammatic cross sectional view taken along line 7-7 in **FIGURE 5**.

1

**LIST OF REFERENCE NUMERALS UTILIZED IN THE DRAWINGS**

2

**PRIOR ART**

- 3   **20**   typical prior art rack system
- 4   **22**   columns
- 5   **24**   beams
- 6   **26**   shelf
- 7   **28**   slots in each of the columns **22**
- 8   **30**   pins in each of the beams **24**
- 9   **32**   step of each of the beams **24**
- 10   **34**   upper portions of slots **28** in each of the columns **22**
- 11   **36**   lower portions of slots **28** in each of the columns **22**
- 12   **38**   plurality of boards of shelf **26**
- 13   **40**   pair of ends of each of the boards **38** of the shelf **26**
- 14   **42**   spacers
- 15   **44**   body of each of the spacers **42**
- 16   **46**   pair of wings of each of the spacers **42**
- 17   **48**   terminal ends of body **44** of each of the spacers **42**

18

**PRESENT INVENTION**

- 19   **50**   lightweight, structurally integral, and strong composite rack shelving of present invention
- 21   **52**   flames

- 1    **54**    extinguishant
- 2    **56**    shelf
- 3    **58**    plurality of through bores through shelf **56** for allowing flames **52** thereunder to pass
- 4            upwardly therethrough instead of sidewardly therealong and extinguishant **54**
- 5            thereabove to pass downwardly therethrough and extinguish flames **52** thereunder.
- 6    **60**    honeycomb core of shelf **56**
- 7    **62**    upper skin of shelf **56**
- 8    **64**    lower skin of shelf **56**
- 9    **66**    composite structure of shelf **56**
- 10   **68**    walls of honeycomb core **60** of shelf **56**
- 11   **70**    cells of honeycomb core **60** of shelf **56**
- 12   **72**    periphery of shelf **56**
- 13   **74**    border
- 14   **80**    inserts

1

## **DETAILED DESCRIPTION OF THE INVENTION**

2        Referring now to the figures, in which like numerals indicate like parts, and  
3        particularly to **FIGURE 3**, which is a diagrammatic perspective view of a rack system  
4        illustrating prior art columns, prior art beams, and a composite shelf of the present invention  
5        in use, with the composite shelf being lightweight, structurally integral, and strong, the  
6        composite rack shelving of the present invention is shown generally at **50**.

7        The configuration of the composite rack shelving **50** can best be seen in **FIGURES 3-**  
8        **7**, which are, respectively, again a diagrammatic perspective view of a rack system illustrating  
9        the prior art columns, the prior art beams, and the composite shelf of the present invention in  
10      use, with the composite shelf being lightweight, structurally integral, and strong, an enlarged  
11      diagrammatic perspective view of the area generally enclosed by the dotted curve identified  
12      by **ARROW 4** in **FIGURE 3** illustrating the composite rack shelving of the present invention  
13      shown in **FIGURE 3**, a diagrammatic top plan view taken generally in the direction of  
14      **ARROW 5** in **FIGURE 4** illustrating the composite rack shelving of the present invention  
15      shown in **FIGURE 4** with a portion of the upper skin thereof removed to reveal a portion of  
16      the honeycomb core thereof, a diagrammatic cross sectional view taken along line **6-6** in  
17      **FIGURE 5**, and a diagrammatic cross sectional view taken along line **7-7** in **FIGURE 5**, and  
18      as such, will be discussed with reference thereto.

19       The composite rack shelving **50** comprises a shelf **56**. The shelf **56** comprises a  
20      honeycomb core **60**, an upper skin **62**, and a lower skin **64**. The honeycomb core **60** of the  
21      shelf **56** is sandwiched between the upper skin **62** of the shelf **56** and the lower skin **64** of the  
22      shelf **56** so as to form a composite structure **66** that is lightweight and strong.

1        The shelf **56** has a plurality of through bores **58** that pass vertically therethrough. The  
2        plurality of through bores **58** through the shelf **56** are for allowing flames **52** thereunder to pass  
3        upwardly therethrough instead of sidewardly therealong and an extinguishant **54** thereabove  
4        to pass downwardly therethrough and extinguish the flames **52** thereunder.

5        The shelf **56** has a surface area, and the plurality of through bores **58** through the shelf  
6        **56** occupy 50% of the surface area of the shelf **56**.

7        The honeycomb core **60** of the shelf **56** comprises walls **68** that define cells **70**.

8        The shelf **56** further has a periphery **72**, and the composite rack shelving **50** further  
9        comprises a border **74**. The border **74** closes off the periphery **72** of the shelf **56**, and is a tape  
10      that is affixed to any wall **68** of the honeycomb core **60** of the shelf **56** that it comes in contact  
11      with, especially any that defines an open cell **70** of the honeycomb core **60** of the shelf **56**  
12      located at the periphery **72** of the shelf **56** so as to maintain structural integrity of the shelf **56**  
13      by closing off any open cell **70** of the honeycomb core **60** of the shelf **56** located at the  
14      periphery **72** of the shelf **56** and form a structurally integral unit with the shelf, and which  
15      folds over to be affixed to the upper skin **62** of the shelf **56** and the lower skin **64** of the shelf  
16      **56**.

17       The composite rack shelving **50** further comprises inserts **80**. The inserts **80** line the  
18       plurality of through bores **58** through the shelf **56**, respectively, and are tapes that are affixed  
19       to any wall **68** of the honeycomb core **60** of the shelf **56** that they come in contact with,  
20       especially any that defines an open cell **70** of the honeycomb core **60** of the shelf **56** caused  
21       by a through bore **58** through the shelf **56** so as to maintain structural integrity of the shelf **56**

1 by closing off any open cell 70 of the honeycomb core 60 of the shelf 56 caused by a through  
2 bore 58 through the shelf 56 and form a structurally integral unit with the shelf 56, and which  
3 fold over to be affixed to the upper skin 62 of the shelf 56 and the lower skin 64 of the shelf  
4 56.

5         Although the invention has been illustrated and described as embodied in a lightweight,  
6 structurally integral, and strong composite rack shelving, it is not limited to the details shown,  
7 since it will be understood that various omissions, modifications, substitutions, and changes  
8 in the forms and details of the device illustrated and its operation can be made by those skilled  
9 in the art without departing from the spirit of the present invention.

10        Without further analysis the foregoing will so fully reveal the gist of the present  
11 invention that others can by applying current knowledge readily adapt it for various  
12 applications without omitting features that from the standpoint of prior art fairly constitute  
13 characteristics of the generic or specific aspects of the present invention.